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THE PIKES

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Description.--Perhaps no other common names of fresh-water fishes are so confused as pike and pickerel. The true pikes all belong to one family (Esocidae) and to one genus (Esox). In North America there are five species: Esox masquinongy (muskellunge), Esox lucius (northern pike, pike, pickerel, jack), Esox niger (chain or eastern pickerel), Esox vermiculatus (mud or little pickerel), and Esox americanus (banded, barred or bulldog pickerel). The fishes with which the true pikes are confused insofar as their names are concerned all belong to the perch family (Percidae). These so-called pikes would be more properly designated if they were called pike-perches. They include three species: Stizostedion v. vitreum (walleye pike, yellow pike or pickerel or pike-perch, pickerel), Stizostedion v. glaucum (blue pike), and Stizostedion canadense (sauger, sand pike).

The pike-perches (Stizostedion) are readily distinguished from the true pikes (Esox) by their two well-separated back (dorsal) fins, the first (forward) of which is spinous. The true pikes are easily recognized by their long, broad, flattish snout shaped like a duck's bill and by the position and shape of the single back and anal fins both of which are situated far back on the body near the tail directly opposite each other and are rounded in outline. Further, the mouth of the pikes is very large extending about halfway the length of the head. The lower jaw projects beyond the upper and both have broad bands of sharp teeth of different sizes. The belly (ventral) fins are located about halfway between the side or shoulder (pectoral) fins and the anal fin.

The following characteristics will distinguish the pikes from all other fishes that have abdominal ventral fins: Ordinary scales on body and sides of head; no fatty (adipose) fin on back but only a single back fin with soft rays; all fins without spines; tail (caudal) fin forked; side fins attached on lower side of body; chin without barbels; gill slits extended far forward below head; gill membranes not attached to the prolongation (isthmus) of the body between the gill openings; upper jaw not protractile, that is, its forward end is firmly joined to the snout; both jaws have sharp teeth of various sizes arranged in broad bands; face duck-like.

The several species of pikes vary in appearance among themselves according to the locality, age, size, and sex. In the muskellunge (E. masquinongy) the lower half of each cheek (usually) and each gill cover (operculum) is scaleless. In contrast to the northern pike, the sides in typical specimens are marked with scattered round or square black spots of various sizes on a background of silvery gray (dark spots on light background), although some individuals are barred vertically rather than spotted and may even have a solid color, and there are usually from 17 to 19 bony rays (branchiostegals) in the membranes that close the gill cavity below instead of 14 to 16 and about 150 pored scales in the (lateral) line along each side of the body instead of about 123. Further, the muskellunge averages much larger than the northern pike in the catch--about 3 1/4 feet or 15 pounds; the present day maximum is 5 feet and 62 1/2 pounds. The fins are spotted with black except in the spotless variety. Some authorities regard the three more or less distinct color forms as subspecies or distinct species. This division is also recognized by the local common names: spotted or leopard musky, barred or tiger musky, and spotless or green or silver musky. Color and color patterns are, however, so variable that they alone can not be used to differentiate varieties of muskellunge. Muskellunge are known to spawn with northern pike and produce hybrids that have the characteristics of both species.

The northern pike (E. lucius) is differentiated from the other pikes as follows: Cheeks fully scaled; lower half of each gill cover without scales; sides of body marked with irregular horizontal rows of numerous whitish or yellowish spots (light spots on dark background), which in the small young often are joined to form vertical bars; all fins except side fins spotted; average length taken by anglers about 21 inches or 2 pounds; the present maximum about 4 1/2 feet and 46 pounds.

The chain pickerel (E. niger) has both the cheeks and gill covers fully scaled. In contrast to the mud and banded pickerel, its body is covered with dark chain-like reticulations (resembling network), the dark streak below the eye runs vertically downward, and there are usually from 14 to 16 bony rays (branchiostegals) in the membranes that close the gill cavity below instead of 11 to 13 and about 125 pored scales in the lateral) line along each side of body instead of about 105 to 108. Further, the chain pickerel has a longer snout (2.2 to 2.4 times in head) and reaches a larger size--up to 3 feet.

The mud pickerel (E. vermiculatus) also has both the cheeks and gill covers completely scaled. The body color is variable, sometimes nearly plain. Typically the body is a grassy to grayish green, heavily barred or streaked with a darker color. No spots occur on the sides or fins. A dark streak runs downward and backward from the eye. The mud pickerel practically never exceeds a length of 14 inches (about 8 ounces); the average being about 8 inches (1 1/2 ounces). It is therefore seldom taken by anglers.

The banded pickerel (E. americanus) like the chain and mud pickerel also has both cheeks and gill covers entirely scaled. The banded and mud pickerel have not yet been satisfactorily differentiated by

scientists. The most striking difference is the comparative length of the snout, the mud pickerel having the longer one. In this species the snout measures from 2.5 to 2.7 times in the length of the head whereas in the banded pickerel this measurement varies from 2.8 to 3.1 times. As shown later the geographical distribution of two species also differs. In color and maximum size they are similar.

Muskellunge (Esox masquinongy).--The muskellunge is scatteringly distributed in the Great Lakes and St. Lawrence basins, including Lake Champlain, and in some lakes of northern Ontario westward to Lakes of the Woods and the upper Mississippi Valley; it occurs also in the Ohio River Valley north to Chautauqua Lake, New York. The species prefers clear, cool waters, and commonly lurks among or near the weed beds or stumps and logs at the edge of channels of the larger streams, or along the shores of the larger lakes. Nowhere is it abundant.

The muskellunge breeds in shallow water usually where the logs, stumps, dead brush, and driftwood are thickest rather than in weed beds. It is said to prefer a bottom covered with soft decomposed vegetable matter or mud usually in bays and marshes and to begin to spawn a few days after the ice is out and to continue throughout April and in some regions throughout May and even into June. The species reaches sexual maturity in the fifth and sixth years of life. A large female may deposit over 250,000 eggs, and the average may reach nearly 100,000 in some localities. The eggs hatch in 2 or 3 weeks. The young may remain in the marshes and streams where they were hatched until late fall or winter. After about 5 weeks at a length of approximately 2 iches they feed entirely on fish and continue to do so to a large extent throughout life. The muskellunge grows rapidly in most waters. The following figures may be accepted as approximating typical growth in most regions. They also give some idea of the length-weight relationship.

Age (years)	Total length (inches)	Weight (pounds)	Age (years)	Total length (inches)	Weight (pounds)	Age (years)	Total length (inches)	Weight (pound
I	8	1/8	VIII	40	16	XV	52	34
II	16	1	IX	43	19	XVI	53	35
III	23	3	X	45	23	XVII	54	36
IV	28	6	XI	46	25	XVIII	55	37
V	32	9	XII	48	28	XIX	56	38
VI	35	12	XIII	49	31	XX	58	39
VII	38	14	XIV	51	33			

Although the maximum age recorded is 20 years and the current maximum weight 62 1/2 pounds, the muskellunge most commonly taken by the sportsmen today range from about 6 to 9 years in age and from 33 to 44 inches in length or from 10 to 21 pounds in wieght; the average size is around 39 inches or 15 pounds. The average sizes, however, vary with lakes and localities. The largest muskellunge on record was reported to have weighed 110 pounds and measured 7 feet 4 inches in length and 51 inches in girth; it was taken in Intermediate Lake near Bellaire, Michigan in about 1914.

Northern pike (Esox lucius).--The northern pike occurs throughout the northern parts of the Northern Hemisphere. In North America its

range extends from Alaska to Labrador and south to northern New England, the Hudson River drainage of eastern New York, the northern part of the Ohio Valley, the entire Great Lakes district, Missouri, and eastern Nebraska. The species prefers clean water in lakes and streams, its favorite haunts being the weed beds in a sluggish current or in the shallow water of a lake. In winter the larger fish seem to descend into deeper water.

Northern pike spawn in March and April, and the season may extend into early May. Before the ice melts the pike begin to approach the shores, and breeding individuals in particular repair towards the inlets. When the lakes and inlets are partially free of ice and the marshes and low-lying meadows around the shores are under water, the adult pike make their way to the shallow, inundated, weedy places and inlets and begin to spawn. In general this species attains sexual maturity in the third and fourth years of life, although some fast-growing individuals may mature when yearlings. A large female may produce over 100,000 eggs; the average is about 35,000. The eggs hatch in about 2 weeks. The young may remain as long as 3 months in the marshes where they were hatched. During the first few weeks the young feed on small water fleas and aquatic insects, but they are soon ready for a diet of fish. The northern pike grows rapidly as is indicated by the following tabular material which represents roughly the typical rate of growth. It also provides information on the approximate length-weight relationship.

Age (years)	Total length (inches)	Weight (pounds)	Age (years)	Total length (inches)	Weight (pounds)
I	10	1/4	VIII	38	11 3/4
II	18	1 1/4	IX	40	14 1/4
III	23	2 3/4	X	44	17
IV	27	5 3/4	XI	45	18 1/2
V	30	5 3/4	XII	46	20
VI	33	8 3/4	XIII	47	21 1/2
VII	36	10 1/4			

The maximum age recorded for the northern pike is 16 years and the maximum weight 46 pounds. In general age goups II to IV predominate in the sportsmen's catch with an average length of about 21 inches and an average weight of about 2 pounds.

Chain pickerel (Esox niger).--The range of the chain pickerel extends from New Brunswick and the St. Lawrence River and Lake Ontario drainages southward, east of the mountains, to Florida and into the Mississippi Valley to Texas, southern Missouri and the Tennessee River system in Alabama. The species lives primarily in the shallow water of lakes and streams in dense vegetation, although at times the adults also frequent the deeper waters of a lake.

The chain pickerel has the same feeding habits as the northern pike subsisting on other animals, mainly fishes, on which they begin to prey very early in life. The two species likewise have the same spawning behavior selecting similar types of breeding places. The chain pickerel spawns in April and early May. The eggs hatch in about 7 to

10 days. Very little is known about its growth in nature. The few data indicate that it is much slower than that of the muskellunge and northern pike and is approximately as follows.

Age (years)	I	II	III	IV	V	VI
Length (inches)	8	11	14	16	18	21
Weight (pound)	0.1	0.3	0.6	1.0	1.5	2.5

No information is available on the maximum age reached by the chain pickerel. It is said to attain a length of 3 feet and a weight of 8 pounds although fish of 2 and 3 pounds are about the average in suitable water.

Mud pickerel (Esox vermiculatus).--The mud pickerel is found in Iowa, southern Wisconsin, Illinois, southern Michigan, southern Ontario, St. Lawrence River, Lake Champlain, and in the upper Mississippi Valley from Nebraska to Pennsylvania and southward to the Gulf Coast from Alabama to Texas. This species is primarily a creek fish, although it may also be common in ponds, lakes, and sluggish rivers. It has a noticeable preference for quiet, muddy waters with abundant vegetation and a soft mud bottom--hence the name "mud pickerel." (For further notes see under banded pickerel below).

Banded pickerel (Esox americanus).--The banded pickerel is restricted to the area extending from southeastern New Hampshire and the Hudson River Valley south through the Atlantic Coastal Plain to Florida and the Gulf Coast. The species prefers habitats similar to those selected by the chain pickerel, being found most commonly in shallow water with dense vegetation.

Very little is known about the habits and natural history of either the mud or banded pickerel. They are said to spawn in early spring--March and April. They apparently attain sexual maturity at a small size as there is one published record of a mature female mud pickerel, 6.2 inches long, that contained some 4,800 presumably mature eggs. There is some evidence to indicate that individuals of this species spawn more than once during a season, and sometimes may even spawn in early autumn. The food of both species seems to be of a purely animal nature including curstaceans, insects, and tadpoles but chiefly small fishes. Their rates of growth have not been investigated although a large female banded pickerel, 13 inches in length, collected on Long Island, N. Y., was found to be in its sixth summer. As this size represents almost the maximum in both species, it is most probable that they rarely live beyond this age. There is also a published record of three mud pickerel taken in Michigan that indicated a growth of 4 to 6 inches during the first year of life.

Commercial production.--In 1941 the commercial catch of pike in the United States amounted to about 260,000 pounds, valued at $20,000, of which 76 percent was produced on the Great Lakes, the Red Lakes, and

the Boundary Lakes of Minnesota. Nearly all (80%) of these fish were northern pike (E. lucius); some 20 percent were chain pickerel (E. niger) produced in Maryland. In 1941 nearly 2 1/2 million pounds of pike, valued at $122,300, were imported (probably all from Canada) so that the United States consumption of pike in that year exceeded 2 3/4 million pounds. Additional thousands of pounds were, of course, also caught and utilized by sportsmen. Pike are usually sold on the market whole although a small percentage is filleted.

Artificial propagation.--The Fish and Wildlife Service collects about 50 million northern pike eggs annually. These eggs are handled at its hatcheries located at New London, Minn. and Guttenberg, Iowa, where 37 1/2 million and 21 1/4 million were the respective totals. A large percentage of the eggs is developed to the fry stage and small numbers of fry are raised to larger sizes. Hatchery-reared northern pike have grown as much as 12 and 13 inches in their first summer of life. Wisconsin and New York propagate both the northern pike and the muskellunge whereas North Dakota and South Dakota raise the former species only.